chemistry in the past and is likely to prove equally valuable to all in the future. No other text-book is so exhaustive and yet relatively still readable. We have taken the opportunity to test it somewhat severely and always found the desired information. The new edition does, however, afford an opportunity of noting the enormous increase in our knowledge of this part of organic chemistry—embracing the carbocyclic and heterocyclic compounds. Our former copy of the ninth edition, bearing the date 1901, is a modest little work of 809 pages, measuring 4 × 6 inches. The new edition requires 1048 pages, measuring 4½ × 7 inches.

Even in 1900 the would-be chemist made some attempt to master the whole of Richter—to-day this is obviously impossible, and the student is forced to specialise at an early stage in his reading. Fortunately, chemical literature is now enriched by very many special monographs of a very readable character and free from too much elaboration of detail. When these are supplemented by Richter—the encyclopædia of chemistry—the student is indeed well armed. We have one suggestion only—namely, the author's name, as well as the journal reference, should be quoted in the references to the original literature. The omission of the author's name prevents reference to the abstracts of the original in the Journal of the Chemical Society or in the *Centralblatt* when the original paper itself is not available.

(5), (6) These translations of well-known standard German works testify to the rank taken by German science in other lands: they are already well known in this country. The second part of vol. iii. of Prof. Neumann's technical analysis contains Schultz's famous monograph on coal tar and artificial colouring matters, which already has a world-wide reputation and forms an appropriate complement to Germany's most famous chemical industry. This is the second French edition translated from the third German edition of the work.

Prof. Corvisy's book is a translation for the first time of the fifth German edition of the first volume of Erdmann's well-known work. The translator refers to the need of such a work in France, where no other book is available for students covering the ground in quite the same way.

(7) This book is intended to be actually used as a laboratory note-book in schools, the pupil having to write his answers in the spaces in the text left for the purpose. Precise instructions are given how to do everything and what to observe and infer, and in quantitative exercises only the actual figures have to be filled in by the schoolboy. The book is elaborately bound and somewhat expensive. We fear we do not agree with the author's interpretation of practical chemistry; indeed, we had hoped that books of this type had ceased to exist.

E. F. A.

PROBLEMS OF LIFE AND REALITY.

(1) *Essais de Synthèse Scientifique.* By E. Rignano. Pp. xxi + 294. (Paris: F. Alcan, 1912.) Price 5 francs.

(2) *Contre la Métaphysique.* By F. Le Dantec. Pp. 255. (Paris: F. Alcan, 1912.) Price 3 francs 75 centimes.

(3) *Modern Science and the Illusions of Prof. Bergson.* By H. S. R. Elliot. With a preface by Sir Ray Lankester, K.C.B., F.R.S. Pp. xix + 257. (London: Longmans, Green and Co., 1912.) Price 5*s.* net.

(4) *Wissenschaft und Wirklichkeit.* By Max Frischeisen-Köhler. Pp. viii + 478. (Berlin: B. G. Teubner, 1912.) Price 8 marks.

(5) *The Young Nietzsche.* By Frau Förster-Nietzsche Translated by A. M. Ludovici. Pp. viii + 399. (London: W. Heinemann, 1912.) Price 15*s.* net.

THE first two of these volumes contain a curiously similar plea for the theorist in science. M. Rignano in his opening essay (1) maintains that there are a number of central problems in the biological sciences, in which there is almost a deadlock, due to the fact that they have been attacked exclusively by two opposite groups of specialists. One such problem, awaiting the synthetic view, is that of the nature of life and growth. Others are: the meaning of religion as viewed from the psychological and the sociological points of view; the economic and ideologic factors in history; the antithesis of socialism and liberal economics. These are dealt with in successive essays. In the first the various transformist theories are reviewed, in order to demonstrate how far-reaching may be the clarifying effects of a single piece of theorising. At the same time the *leit-motiv* of the whole volume is introduced—the mnemonic principle. The recapitulation of phylogenetic development in ontogenesis is essentially mnemonic, as is assimilation.

The same principle is next applied more in detail to the problem of growth, by means of a summary of the author's "centro-epigenetic" theory of development. This asserts that growth is determined by a nervous circulation, independent of a nervous system, consisting of discharges of specific nervous energy accumulated in the germ-plasm, each discharge depositing a substance apt in decomposing to regenerate the same specific nervous current. "Memory" in this wide sense is next applied to explain the affective tendencies (conations) which are regarded as strivings to regain physiological equilibrium. Thus one and the same explanation holds of all the finalism of life, namely, the mnemonic property of vital substance, that faculty of "specific accumulation" which belongs exclusively to nervous energy, itself the basis of life. The other essays reveal the same acuteness, fertility, and confidence in theorising.

(2) M. le Dantec, after a semi-serious demonstration that the philosopher is an artist, to be appreciated by those vibrating in harmony with him rather than understood by mankind at large, and a plea for more reasoning in natural science and less "kitchen-technique," proceeds also to consider the central problems of biology. All vital phenomena fall under the head of "functional assimilation." The organism assimilates *qua* organ of its function at the moment. Thus a mammal into whose peritoneum cow's milk is injected assimilates this, if it survives, *qua* organ of the struggle against cow's milk, but not absolutely, for it retains a trace or "memory" (cf. Rignano) in that its serum will henceforth give a precipitate with cow's milk. Thus it is impossible to separate "nature" and "nurture," though the part played by the latter must be relatively small "on pain of death." Like M. Rignano, a Neo-Lamarckian, M. le Dantec holds that among the transmissible acquisitions are the instincts, and logic, "the *résumé* of ancestral experience."

(3) Mr. Elliot's view of philosophy is, broadly, that it consists in making unfounded and untestable statements about the universe—mapping the back of the moon. Now this is surely a mistake; philosophy is not description, but explanation; and to explain is to bring unconnected or conflicting facts under one general law or notion. Sometimes it is merely a question of selecting the right familiar notion, but often a *new* "appropriate conception" has to be created, a process the difficulty and importance of which Mill so greatly underestimated; and philosophical explanation is evidently likely to be of this nature.

Thus while it is legitimate criticism of a philosophy to say that it is incomprehensible (a line pretty effectively worked by Schopenhauer) it is unreasonable to insist that it must be easily comprehensible, or use only everyday notions. Nor can one fairly complain if philosophers do not adduce specific facts for their theories. Negative evidence can disprove an explanatory hypothesis; positive evidence can only "verify" it cumulatively, and here the facts are broadly not in dispute. This, if correct, invalidates much that Mr. Elliot says about M. Bergson's "besetting fallacies," *e.g.*, the "mannikin fallacy." Again, his keen scent for "false analogy" often leads Mr. Elliot to take as demonstration what is clearly meant as "explication." While always acute and often touching on real difficulties, Mr. Elliot too often allows himself to be tempted, in sporting parlance, into smashes which find the net.

(4) Perhaps the least of the differences between the last work and Herr Frischeisen-Köhler's essay in critical realism is that in the latter M. Bergson is not so much as mentioned. The nineteenth century saw a movement of opposition to the intellectualism of the seventeenth and eighteenth centuries, and the book aims at helping to find a common point of view for the sciences typical of the two points of view—mathematics and history, the latter of which can never be based on pure thought. The method is a critical consideration of the conditions involved in consciousness, which themselves contain the bases of knowledge. Of the categories or modes of experiencing involved in consciousness, however, only that of reality is considered.

The closely-reasoned exposition is impossible to summarise here, but it involves the discussion of the two main modern attempts to derive all experience from the laws of pure thought—the logical idealism of the Marburg school and the philosophy of values developed by Windelband and Rickert. Finally, the empirical bases of our notion of reality are found, above all, in experiences of striving and resistance. Like fish in a glass bowl we are unable to go further in some directions, and since this experience always occurs in conjunction with certain sense-impressions, we recognise in these that which sets limits to our subjectivity. The real remains, indeed, always within the conditions of consciousness in general, but within consciousness the independence of the objective world from the self is assured. The book is a clearly-written, cautious, and eminently helpful discussion of the difficult problems with which it deals.

(5) Having nothing in common with the other works except that it deals with a philosopher, the life of Nietzsche by his sister is an interesting and pleasing account of the first happy portion of that tragic existence. Strangely unlike a morose apostle of hardness is the almost painfully well-behaved child in the country parsonage, the brilliant schoolboy with all the German idealism and *schwärmerei*, the student shocked by the coarseness of university conviviality, the youthful professor of classics, the heroic but too sensitive ambulance volunteer in the Franco-Prussian war. The book takes us to the end of the friendship

with the Wagners, and it is its main weakness that it fails to make clear the reason either for the intensity or for the abrupt end of this devotion. The translation is quite satisfactory, and some excellent portraits add much to the book's effectiveness.

TEXT-BOOKS ON HEAT AND THERMODYNAMICS.

(1) *An Introduction to the Mathematical Theory of Heat Conduction.* With engineering and geological applications. By Prof. L. R. Ingersoll and O. J. Zobel. Pp. vi+171. (London and Boston: Ginn and Co., n.d.) Price 7*s.* 6*d.*

(2) *The Laws of Thermodynamics.* By W. H. Macaulay. Pp. viii+71. (Cambridge: University Press, 1913.) Price 3*s.* net.

(3) *A Text-book of Thermodynamics (with special reference to Chemistry).* By J. R. Partington. Pp. viii+544. (London: Constable and Co., Ltd., 1913.) Price 14*s.* net.

(4) *Lehrbuch der Thermodynamik.* Nach Vorlesungen von Dr. J. D. v. d. Waals. Bearbeitet von Dr. Ph. Kohnstamm. Zweiter Teil. Pp. xvi+646. (Leipzig: J. A. Barth, 1912.) Price 12 marks.

(5) *Leçons de Thermodynamique.* By Dr. Max Planck. Avec une conference du même à la Société chimique de Berlin sur Le Théorème de Nernst et L'Hypothèse des Quante. Ouvrage traduit sur la troisième édition allemande (augmentée). By R. Chevassus. Pp. 310. (Paris: A. Hermann et Fils, 1913.) Price 12 francs.

(1) THIS book is the outcome of the authors' teaching experience, and as one might expect, covers the ground usually required for a university degree. The subject-matter includes the Fourier equation, the steady flow of heat in one and more than one dimension, periodic flow in one dimension, Fourier's series applied to the linear flow of heat in the case of an infinite as well as semi-infinite solid, heat sources, slab and radiating rod, and in addition radial flow, instantaneous heat source at a point, sphere with surface at constant temperature, sphere cooled by radiation, and the general case of heat flow in an infinite medium. The concluding chapter deals with the formation of ice. The appendix contains a list of values for the thermal conductivities and emissivity factors, as well as the more commonly occurring integrals and miscellaneous formulæ. The striking feature about the book is the prominence which is given to the experimental applications of the expressions derived. These belong mainly to engineering, though the student of pure physics will find many of them of considerable interest. At the end of each chapter there are a number of problems to be worked out. As the work covers a relatively large field the authors have had to restrict themselves to typical cases. Full references are given, however, on particular points to larger works and original papers. The authors have compiled a very useful text-book of moderate size, which should appeal to a fairly wide circle of readers.

(2) This monograph contains a succinct account of the fundamental principles of thermodynamics. The writer has been singularly happy in combining precision and accuracy of statement with remarkable lucidity and readableness. Although he warns us in the preface that the tract should be read "in conjunction with other information," it ought to be found by no means beyond the grasp of the beginner. The subject is presented, in the first instance, from the engineer's point of view, though the nature of the publication is such as to preclude any very detailed illustrations of an applied character. This has the advantage, however, of making the work more interesting to the general reader. The author commences by explaining perfect differentials, and then passes on to the first and second laws and the four thermodynamic relations. In addition to the perfect gas, considerable space is devoted to the treatment of wet and dry steam, and a short account of the lead accumulator. The monograph as a whole forms a very excellent introduction to engineering thermodynamics.

(3) The first sixteen chapters of Mr. Partington's "Thermodynamics" represent a very full and detailed account of the classical theory along the usual lines. The two final chapters of the book deal rather briefly—considering the growing importance of the subject—with Nernst's heat theorem and the theory of energy quanta. The reader is assumed to be fairly well equipped as far as mathematics is concerned, and for chemists, at any rate, the book will in places make fairly severe reading. All the thermodynamic potentials (Gibbs' μ included) are freely employed, as well as the cycle method. Perhaps the least satisfactory is the chapter on electrochemistry. An English book dealing with thermodynamics from the chemical point of view is rather badly wanted, however, and Mr. Partington's deserves to meet with a good reception.

(4) As anyone familiar with van der Waals' writings will anticipate, the present work is by no means a text-book of thermodynamics in the ordinary sense of the term. This second volume, like the first (which appeared in 1908), is based upon Prof. van der Waals' lectures, the material being edited for the Press by Prof. Kohnstamm. As the sub-title expressly states, this volume deals